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TWO TABLES

OF THE VARIETIES IN THE FIRST AND SECOND CASES OF
OBLIQUE SPHERICS.

BY WILLIAM CROSWELL, A. M.

Inclosed with a letter to the Honorable John Davis, Esq.

I. A TABLE

Of the varieties in the first case of oblique spherics, in which are given two sides, and an angle opposite to one of those sides.

N	Given \angle	Giv. sid.	Side adjacent to given angle	\angle op. adj. s	Perpr. falls
1	acute	acute	equal to opposite side	acute	within
2	acute	acute	less than opposite side	acute	within
3	acute	acute	greater than opposite side	uncertain	uncertain
4	acute	obtuse	greater than opposite side	obtues	without
5	acute	mixed	acute less than supplement opp. side	acute	within
6	acute	mixed	obtuse equal to supp. opposite side	obtuse	without
7	acute	mixed	obtuse less than supp. opp. side	uncertain	uncertain
8	acute	mixed	obtuse greater than supp. opp. side	obtuse	without
9	obtuse	acute	less than opposite side	acute	without
10	obtuse	obtuse	less than opposite side	uncertain	uncertain
11	obtuse	obtuse	equal to opposite side	obtuse	within
12	obtuse	obtuse	greater than opposite side	obtuse	within
13	obtuse	mixed	obtuse greater than supp. opp. side	obtuse	within
14	obtuse	mixed	acute equal to supp. opposite side	acute	without
15	obtuse	mixed	acute less than supp. opposite side	acute	without
16	obtuse	mixed	acute greater than supp. opp. side	uncertain	uncertain

It appears above that only four varieties in this case are ambiguous.

Let the sides be $114^{\circ} 30'$ and $56^{\circ} 40'$, and let the angle opposite to $114^{\circ} 30'$ be $125^{\circ} 20'$. The angle opposite to $56^{\circ} 40'$ is found by calculation to be $48^{\circ} 31'$, or $131^{\circ} 29'$.

Robertson, from whom this example is taken, observes, that the affection must be determined by construction.

This example belongs to the 15th variety in the Table, whence the angle concerned is found to be acute ; and the affections of the other required parts are determined.

In constructing the ambiguous varieties, two triangles are produced, equally agreeing with the example ; and the uncertainty continues.

II. A TABLE

OF THE VARIETIES IN THE SECOND CASE OF OBLIQUE SPHERICS,
IN WHICH ARE GIVEN TWO ANGLES, AND A SIDE OPPO-
SITE TO ONE OF THOSE ANGLES.

N	Given sid.	Given ∠	Angle adjacent to given side	sid.op. adj. ∠	Perpr. falls	Angle m	Arc M	Angle n	Arc N
1	acute	acute	equal to opposite angle	acute	within	acute	acute	acute	acute
2	acute	acute	less than opposite angle	acute	within	acute	acute	acute	acute
3	acute	acute	greater than opposite angle	uncer.	within	acute	acute	uncer.	uncer.
4	acute	obtuse	greater than opposite angle	obtuse	within	obtuse	obtuse	acute	acute
5	acute	mixed	acute less than supp. opp. ∠	acute	without	acute	acute	acute	acute
6	acute	mixed	obtuse equal to supp. opp. ∠	obtuse	without	obtuse	obtuse	acute	acute
7	acute	mixed	obtuse less than supp. opp. ∠	uncer.	without	obtuse	obtuse	uncer.	uncer.
8	acute	mixed	obtuse greater than supp. opp. ∠	obtuse	without	obtuse	obtuse	acute	acute
9	obtuse	acute	less than opposite angle	acute	within	obtuse	obtuse	acute	acute
10	obtuse	obtuse	equal to opposite angle	obtuse	within	acute	acute	acute	acute
11	obtuse	obtuse	less than opposite angle	uncer.	within	acute	acute	uncer.	uncer.
12	obtuse	obtuse	greater than opposite angle	obtuse	within	acute	acute	acute	acute
13	obtuse	mixed	acute equal to supp. opp. ∠	acute	without	obtuse	obtuse	acute	acute
14	obtuse	mixed	acute less than supp. opp. ∠	acute	without	obtuse	obtuse	acute	acute
15	obtuse	mixed	acute greater than supp. opp. ∠	uncer.	without	obtuse	obtuse	uncer.	uncer.
16	obtuse	mixed	obtuse greater than supp. opp. ∠	obtuse	without	acute	acute	acute	acute

Let the angles be $48^{\circ} 31'$ and $125^{\circ} 20'$, and the side opposite to $125^{\circ} 20'$ be $114^{\circ} 30'$. The side opposite to $48^{\circ} 31'$ is found by calculation to be $56^{\circ} 41'$ or $123^{\circ} 19'$.

This example belongs to the 14th variety in this Table, whence the side concerned is acute ; the angle n and arc N are also acute, and thus the true values of the other required parts are found.

These Tables supersede projection. They might be contracted, or reduced to one ; but without advantage. They are probably correct, as every variety was determined (if memory fails not) by six constructions.